

CLAIMS

What is Claimed Is:

1. An air bearing surface used in a slider, comprising:

each member of a deflection rail collection resides in a negative pressure pocket formed

5 between a leading air bearing surface and a central island containing a read-write head;

said deflection rail collection comprises a left deflection rail and a right deflection rail;

wherein said left deflection rail is separated by a first gap from said right deflection rail;

wherein said gap is greater than zero distance.

10 2. The apparatus of Claim 1, wherein said leading air bearing surface has a depth D2 from said negative pressure pocket; and

wherein for each member of said deflection rail collection, a height of said member is greater than zero.

15 3. The apparatus of Claim 2, wherein for all of said members of said deflection rail collection, said height of said member is essentially the same.

4. The apparatus of Claim 3, wherein for each member of said deflection rail collection, said height of said member is essentially equal to said depth D2.

20 5. The apparatus of Claim 2, wherein for at least one of said members of said deflection rail collection, said height of said member is less than said depth D2.

6. The apparatus of Claim 5, wherein said central island includes a ledge starting
25 distance D1 from said depth D2;

wherein for said member of said deflection rail collection, said height of said member is essentially the same as said depth D2 minus said depth D1.

7. The apparatus of Claim 2, wherein for at least one member of said deflection rail collection, said height of said member is greater than said depth D2.

5 8. The apparatus of Claim 2, wherein for each member of said deflection rail collection, said height of said member is less than said depth D2.

9. The apparatus of Claim 1, wherein each member of said deflection rail collection includes a front face at an angle to the principal axis of said slider to aid deflecting an incoming
10 particle away from said central island, whenever said slider is in operation.

10. The apparatus of Claim 9, wherein for each member of said deflection rail collection, said front face aids deflecting said incoming particle away from said read-write head.

15 11. The apparatus of Claim 1, wherein for each member of said deflection rail collection, said angle of said front face is between ninety degrees and one hundred and eighty degrees.

20 12. The apparatus of Claim 11, wherein for each member of said deflection rail collection, said angle of said front face is between one hundred and twenty degrees and one hundred and seventy degrees.

25 13. The apparatus of Claim 1, wherein said first gap provides means for diminishing said negative air pressure in said negative pressure pocket.

14. The apparatus of Claim 13, wherein means for diminishing said negative air pressure includes said first gap inducing at least one air current between said left deflection rail and said right deflection rail.

15. The apparatus of Claim 1, wherein said left deflection rail is closer to said leading air bearing surface than said right deflection rail.

16. The apparatus of Claim 1, wherein said right deflection rail is closer to said leading air bearing surface than said left deflection rail.

17. The apparatus of Claim 1, wherein said first gap provides means for diminishing said negative air pressure in said negative pressure pocket.

18. The apparatus of Claim 1, wherein said deflection rail collection further comprises a central deflection rail.

19. The apparatus of Claim 18, wherein said central deflection rail mirrors about the principal axis of said slider.

20. The apparatus of Claim 18, wherein said central deflection rail includes a central deflection left front face and a central deflection right front face;
wherein said central deflection left front face supports deflecting a first incoming particle away from said central island; and
wherein said central deflection right front face supports deflecting a second incoming particle away from said central island.

21. The apparatus of Claim 18, wherein a second gap separates said right deflection rail from said central deflection rail; and
wherein a third gap separates said left deflection rail from said central deflection rail.

22. The apparatus of Claim 21, wherein said second gap supports diminishing negative pressure through said first gap.

23. The apparatus of Claim 21, wherein said third gap separates supports diminishing negative pressure through said first gap.

24. The apparatus of Claim 18, wherein said left deflection rail is essentially as close
5 to said leading air surface as said right deflection rail.

25. The apparatus of Claim 1, wherein for at least one of said members of said deflection rail collection, said member includes a back face.

10 26. The apparatus of Claim 25, wherein for at least one of said members of said deflection rail collection, said back face is essentially parallel to at least one of said front faces of said member.

15 27. The apparatus of Claim 26, wherein for said at least one member of said deflection rail collection, at least one of said front faces is essentially straight.

28. The apparatus of Claim 27, wherein for said at least one member of said deflection rail collection, at least two of said front faces is essentially straight.

20 29. The apparatus of Claim 26, wherein for said at least one member of said deflection rail collection, at least one of said front faces is essentially curved.

25 30. The apparatus of Claim 25, wherein for at least one of said members of said deflection rail collection, said back face connects to at least two of said front faces of said member.

31. The apparatus of Claim 30, wherein for said at least one member of said deflection rail collection, at least one of said front faces is essentially straight.

32. The apparatus of Claim 31, wherein for said at least one member of said deflection rail collection, at least two of said front faces is essentially straight.

33. The apparatus of Claim 30, wherein for said at least one member of said
5 deflection rail collection, at least one of said front faces is essentially curved.

34. The apparatus of Claim 1, wherein the length of said left deflection rail is essentially the same as the length of said right deflection rail.

10 35. The apparatus of Claim 1, wherein the length of said left deflection rail is less than the length of said right deflection rail.

36. The apparatus of Claim 1, wherein the length of said left deflection rail is greater than the length of said right deflection rail.

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37. A head gimbal assembly including said slider using said air bearing surface of Claim 1.

38. An actuator arm including said head gimbal assembly of Claim 37.

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39. An actuator assembly including said actuator arm of Claim 38.

40. A hard disk drive, including said actuator assembly of Claim 39 positioning said read-write head to access a rotating disk surface within said hard disk drive.

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41. The apparatus of Claim 40, wherein said slider flies within a distance D3 of said rotating disk surface while said read-write head accesses said track.

42. The apparatus of Claim 41, wherein said distance D3 is less than fifteen nano-meters (nm).

43. The apparatus of Claim 42, wherein said distance D3 is less than ten nano-meters (nm).

44. The apparatus of Claim 43, wherein said distance D3 is less than five nano-meters (nm).

45. The apparatus of Claim 44, wherein said distance D3 is less than three nano-meters (nm).

46. A method of operating said slider of Claim 1 in said hard drive, comprising the steps of:

for each of said members of said deflection rail collection, said member causing an incoming particle to tend to deflect away from said central island; and
said first gap diminishing additional negative pressure in said negative pressure pocket.

47. The method of Claim 46, wherein the step of said first gap diminishing said negative air pressure, is further comprised of the step of:

said first gap inducing an air current between said left deflection rail and said right deflection rail which diminishes additional negative pressure.

48. A method of Claim 46, wherein the step of said member causing an incoming particle to tend to deflect away from said central island, is further comprised of the step of:

said members providing at least one front face to collide with said incoming particle to create the tendency to deflect away from said central island.

49. A method of making a head gimbal assembly, comprising the steps of:
coupling said slider of Claim 1 to a flexure to present the air bearing surface and read-
write head; and
coupling said flexure to a load beam.

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50. A method of making an actuator arm, comprising the step of: coupling said head
gimbal assembly of Claim 49 through said load beam to said actuator arm.

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51. A method of making an actuator assembly, comprising the step of:
coupling at least one of said actuator arms of Claim 52 to an actuator pivot.

52. A method of making a hard disk drive, comprising the step of:
mounting said actuator assembly through said actuator pivot to a disk base.

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53. Said hard disk drive as a product of the process of Claim 52.

54. Said actuator assembly as a product of the process of Claim 51.

55. Said actuator arm as a product of the process of Claim 50.

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56. Said head gimbal assembly as a product of the process of Claim 49.

57. Said slider using said air bearing surface of Claim 1.